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and to establish communications with South Africa, which will be the base of supplies.

It has long been known that there is coal in Kerguelen and the brothers published two analyses of this mineral as they have found it in different parts of the island. They say that it burns well in stoves and in the furnaces of their steamers, but its value in the development of the island cannot be estimated until the extent of the coal measures has been ascertained.

Another steamer, the *Espoir*, of 500 tons, left France for the Island in October last. It is proposed to give large attention to the development of animal-growing and, hereafter, to give shelter to the young lambs, if it is found that they would thrive better with such care. The whaling industry promises to be very profitable, and though the Norwegians have been admitted as co-workers, the Bossière brothers have relinquished none of their concessionary rights. The sea elephant was hunted, early in the last century, by hundreds of ships, and, according to the *Challenger Reports*, the animal had almost completely disappeared by 1840. But they are found to-day, in vast numbers, in the waters around Kerguelen and have established their breeding places (they belong to the seal family) on the island. Their skin and blubber are highly valued and the industry is likely to approach that of whale fishing in value. The brothers are sanguine that the raising of sheep, cattle and hogs will be very profitable, express the conviction that Kerguelen will become a prosperous colony and add:

"We may be permitted to hope that, while we are working for ourselves, we may deserve the favorable opinion of our country."

GEOGRAPHICAL RECORD

NORTH AMERICA

STUDY OF AMERICAN DESERT AREAS. The Desert Botanical Laboratory of the Carnegie Institution of Washington is engaged in much work which is of interest to geographers. Under the direction of Dr. D. T. MacDougal it is not only carrying on most important investigations upon the relation of plants to the environment of deserts, but is doing actual exploration and other distinctly geographic work. Some of this work has already been described in articles by Dr. MacDougal upon the Salton Sea, the Desert of Papagueria (*Bull.* Vol. 40, 1908, pp. 705-725), and the Delta of the Colorado (*Bull.* Vol. 39, 1907, pp. 705-729).

During the past spring Prof. Ellsworth Huntington, of Yale University, has been cooperating with the Laboratory in a study of American deserts as compared with those of Asia. The work of the present season was confined chiefly to southern Arizona in the vicinity of Tucson, the site of the Desert Laboratory, and to the adjacent parts of the Mexican state of Sonora. From Tucson, trips were made in various directions to a maximum distance of 200 miles. An automobile was used most of the time. It proved to be admirably adapted to this kind of work where it is often necessary not only to travel great distances over the vast slopes of piedmont gravel which Tollman has called "bahadas," but also to carry water for several days.

The work thus far has been of a preliminary nature. In order to give it a certain completeness, however, two basins were chosen for special study. One was that of the Santa Cruz river, which rises on the Mexican border and flows north through Arizona, past Tucson, to the Gila river. The other was the Asuncion, formed by the junction of the Altar and Magdalena, which rise not far from the Santa Cruz, and flow southwestward through Mexico to the Gulf of California.

The first feature which strikes the student of deserts in southern Arizona and Sonora is the great amount of arboreal vegetation in proportion to the rainfall. This phenomenon leads naturally to a study of the relation of the climate of the country, with its summer and winter seasons of rainfall, to the climatic belts of the earth as a whole, and to certain regions of monsoon deserts in northwestern India in particular.

Another interesting subject of study is the topographic forms due to prolonged aridity, a subject which has been more or less frequently discussed since Blanford wrote his famous paper on Persia over thirty years ago. The allied question of the effect of changing climatic conditions upon topography has been almost entirely neglected, in spite of the fact that all geologists admit that the climatic conditions of the glacial period must have been subject to quite as much change in deserts as in glaciated regions. A good deal of time was therefore devoted to a study of the terraces of gravel which are found along almost every river in the arid parts of North America, and which may be of climatic origin. As an aid in their investigation it was found desirable to obtain as full data as possible on the present action of streams during floods and dry seasons, and particularly on the river channels which, in scores of places, have been cut to a depth of from ten to fifty feet during the last thirty years.

A study of terraces leads almost inevitably to attempts to date them, and this opens the question of the occurrence of changes of climate during historic times. Somewhat to Prof. Huntington's surprise, he found that southern Arizona is full not only of the well-known ruins which have been so much discussed, but of others which have never been described, or, for the most part, even noticed by scientists. They are insignificant in appearance, being merely rows of stones, low mounds, and patches of pottery. They are of great age, certainly 1,000 years old in many cases, and in some cases probably 2,000.

As they occur not only in the regions where agriculture is now carried on, but in many places which are now uninhabitable, it appears probable that the population was one far denser than now. The peculiar character of these relics of ancient civilization, and especially the location of certain old fields seems inexplicable unless climatic changes have occurred. In order to test this conclusion

the investigator attempted to reconstruct the economic conditions of the primitive people who inhabited the ruins, and of the Indians who drove them out, or at least succeeded them. The most significant feature of the evidences as to the climate of the past 2,000 years is the remarkable agreement between America and Asia.

The spring of 1910 was an extremely bad one for the farmers and cattle men of Arizona by reason of drought. For the same reason it was of unusual interest to students of climate. Dying cattle, barren fields, dry springs, and discouraged settlers presented a forcible illustration of the manner in which the density of population is strictly limited by climatic factors wherever the inhabitants depend upon the soil without extensive means of transportation.

A preliminary report of Prof. Huntington's conclusions will be published shortly by the Carnegie Institution.

MOVEMENT OF LAKE SUPERIOR IRON ORES. The U. S. Geological Survey has issued a short report by John Birkinbine, statistician of iron production, on the movement of Lake Superior iron ores in 1909. The total shipment amounted to 42,504,110 long tons, a quantity greater than that shipped in any preceding year. Most of this ore was shipped by water. The principal shipping docks are at Two Harbors and Duluth, Minn., Superior and Ashland, Wis., and Marquette, Mich. Nearly 36,000,000 tons shipped from the docks passed through the Sault Ste. Marie canals and through Lakes Michigan and Huron to their places of destination, the greater part of the ore being delivered at Toledo, Sandusky, Huron, Lorain, Cleveland, Fairport, Ashtabula, and Conneaut, Ohio; Erie, Pa.; and Buffalo and Tonawanda, N. Y. Most of the ore received at these ports is consumed in eastern Ohio and western Pennsylvania. In 1909 about 23,000,000 tons were sent to the Cleveland and Pittsburg region. The Lake Superior ores represent about 80 per cent. of the total iron-ore production of the United States.

GEOLOGICAL SURVEY OF CANADA. Mr. R. W. Brock, Director of the Geological Survey, in his *Summary Report* for 1909 (307 pp., Ottawa, 1910) says that his staff is too weak, numerically, to accomplish even the most pressing work in a country so large as Canada, and, to some extent, outside assistance was engaged for geological, topographical and ethnological field work. Almost all of the work was along strictly economic lines. It included mapping, working out geological structures, investigating economic possibilities and in other ways securing and making known the geological information required by the prospector and minor to promote the locating and opening of deposits of economic minerals. While the geologists of the survey are not engaged in prospecting, they sometimes make important discoveries. During the year, Mr. Cairnes discovered a new occurrence of coal in the White Horse district and Mr. Dowling found a new and apparently important coal basin in Alberta. Mr. LeRoy's work in the Slocan will stimulate mining there and assist in the discovery of new ore bodies. The facts learned by Mr. Dresser, as to the occurrence of asbestos, afford a valuable clue in prospecting for this important mineral. The scientific investigation of the clays of the Maritime provinces by Dr. H. Ries of Cornell University and Mr. J. Keele opens an important series of studies, which, it is hoped, may be extended to cover the settled portions of the whole Dominion. It has become important to correlate and compile the information on a particular subject into one handy volume for reference. A beginning has been made in this direc-

tion, an official has been appointed to give his whole time to the work and several volumes have already appeared or will soon be published. Most of the volume is given to reports on the work done during the year.

SOUTH AMERICA

EXPLORATORY WORK IN BOLIVIA. The *Bulletin* for April, 1909, vol. 41, contained a note on the work of Major P. H. Fawcett in surveying the boundary between Bolivia and Brazil. Since that time two articles have appeared by Major Fawcett: "Survey Work on the Bolivia-Brazil Boundary," *Geog. Journ.*, vol. 35, 1910, pp. 163-166, and "Explorations in Bolivia," *Geog. Journ.*, vol. 35, 1910, pp. 513-532. The former is a report of progress of the Bolivia-Brazil Boundary Commission for 1909; the latter is a complete account of the South American explorations of Major Fawcett up to this time.

The "Explorations in Bolivia" discusses three points: Some general features of Bolivia apart from political and commercial conditions, the nature of exploration in the uncivilized parts of South America, and such personal observations as the author was able to make during the boundary explorations that have been carried on during the past few years. The article brings again to our attention with great emphasis the danger to human life in conducting exploratory and developmental enterprises on the tropical plains. On the lower Beni 25% of the crews of the river boats perish annually of accidents and fever. Of a party of 23 men sent into the upper Madre de Dios 6 years ago to look for rubber only 3 returned, the others died of starvation and its effects. All but 7 of an expedition of 300 peons died while exploring the Rio Blanco, a tributary of the Abuna, a few years ago. Five of the 6 peons on Fawcett's boundary expedition north of Matto Grosso died after their return through fever and the after-effects of starvation. Scores of expeditions have in the past been lost, decimated, or rendered useless through lack of strong constitutions, or through want of determination or experience. Although he has unlimited resources at his disposal, Major Rondon, who is constructing a telegraph line from Cuyaba to the falls of the Madeira, suffers tremendous losses in officers and men in his little army of 500. The pest of insects can not be adequately described. They so reduce and annoy the traveler and resident that fever finds the body an easy prey.

Two other difficulties, the sudden and extreme changes of temperature and the lack of laborers and trails for transportation, are discussed. At Riberalta, 11° S., a change from 104° to 44° has been recorded in two hours; and in August, 1908, a drop from 78° to 41° was observed. These sudden changes are common from May to October and are the usual accompaniments of south winds that last from two to four days with rain.

The difficulties of securing adequate labor supply is everywhere the dominant one and even transcends the diseases, the heat, and the insects, in the problem of developing resources. Peons are usually unobtainable at any price. Both the Indian and the half-breed are unreliable, difficult to please, lazy, and desert without notice. East of the Bolivian Cordillera, riches are measured by the number of men at the command of an individual. A man with 50 peons is said to be a capitalist. Forced labor is the result, and in its train have come all the evils of race hatred and warfare. A perpetual war of reprisals is waged between civilized and savage men. That slavery actually exists in the Amazon

basin is a fact that is hidden partly by the word "peonage" and partly by the stout denials of the rubber men, whose business rests directly upon the evil system.

Without at all criticizing this valuable paper in regard to details of observations made by the author, we may yet say that some of the general statements need modification. The broad statement that there is coal on the high plateau of Bolivia and coal in quantities east of the mountain belt might be thought to mean a great deal; as a matter of fact, the extent of the coal resources is undetermined, but it is reasonably clear that there is very little indeed on the plateau. Nor can irrigation alone solve the problems of the high plateau. The climate is irremediable, much of highland Bolivia is barren salar and steep mountain slope, and the available water, even if skillfully employed, would not irrigate all of the land.

I. B.

AFRICA

BELGIAN EMIGRATION INTO THE CONGO. In order to promote colonization in the Katanga District of the Belgian Congo, from the mother country, the Government has decided to give to approved colonists and their families free transportation (third class) from Belgian to Katanga and free freightage for their household effects and implements of labor. This aid will be extended only to those who are 21 years old or over, healthy and with sufficient means to establish themselves in the new country or who have a contract assuring them of employment in Katanga. This district is the center of the chief mining interests of the Belgian Congo and is one of the most elevated and least unhealthful parts of the Colony (*Kol. Zeitsch.*, No. 17, 1910).

LAKE CHAD AND CLIMATIC CHANGES. Contradictory reports continue to come regarding the evidence of changes of climate to be found in the Lake Chad region. The general view is, probably, that the lake is diminishing in size as a result of a change (or oscillation) of climate to a drier period. In *Petermann's Mitteilungen* for January, 1910, Dr. Hugo Marquardsen emphatically expresses the opposite view. "Personally," he says, "on the basis of all the results of exploration and of my own observations, I have reached a very different conclusion." At the present time, the writer agrees that there is a marked retreat of the waters of the lake, but this phenomenon cannot be shown to have existed far back. From 1823 to 1902 there was no diminution in the size of the lake. The present loss of water began suddenly after 1902, and is therefore not to be attributed to any permanent climatic control.

R. DEC. W.

ASIA

DR. SVEN HEDIN'S METEOROLOGICAL OBSERVATIONS IN TIBET. In the June number of *Petermann's Mitteilungen* there is published an account of Dr. Sven Hedin's travels in Tibet in 1906-08, in which the meteorological results are briefly reviewed. A full study of the data has not yet been made. The region is one concerning whose meteorology practically nothing has thus far been known. Dr. Hedin took observations thrice daily during the whole period of his journey, including pressure, temperature, humidity, direction and force of the wind, cloudiness and rainfall, together with notes on other phenomena such as insolation, temperature of lakes and springs, etc. Nearly twenty months were spent, with the charac-

van, under a pressure of about 15.75 inches, at three miles above sea level. Greater altitudes were reached, as *e. g.*, the Dingla Pass, July 8, 1908, where the altitude was about 19,300 feet and the pressure below 15 inches. The strong constitutions of the men and animals living at these great altitudes is noteworthy; yaks, antelopes, donkeys, cattle, sheep and dogs are all unusually strong and active. Dr. Hedin's observations showed temperature ranges between 68° and -40°. Even in the most severe winter storms the temperature was observed to be between -5° and -20°. Precipitation comes in all seasons, the winter snowstorms being especially severe. The intensity of insolation is naturally very great. Dr. Hedin points out that the summer is much rainier than the winter. In winter, more snow falls in western Tibet than in eastern, while in summer it rains more in eastern Tibet. There is more snowfall on the highest elevations of the Trans-Himalaya in summer than in winter, a fact which is explained by the moisture brought by the southwest monsoon.

R. DEC. W.

POLAR

PLANS OF THE BRITISH ANTARCTIC EXPEDITION OF 1910. Captain R. F. Scott's large steam vessel, *Terra Nova*, left Cardiff for the south on June 15. Capt. Scott has outlined the plans of his expedition (*Geog. Journ.*, Vol. xxxvi, No. 1, pp. 11-20), and the following facts are taken from this publication:

The *Terra Nova* is expected to reach Melbourne, *via* Cape Town, about Sept. 13. After a week at Melbourne, the vessel will go to Sydney and thence to Lyttelton, New Zealand, which she will reach about Oct. 13. Here she will take on petrol for the motor sledges, forage for the ponies, frozen mutton, the motor sledges and twenty ponies and thirty dogs which Mr. Meares has been collecting in Siberia. The expedition will leave New Zealand towards the end of November and hopes to reach McMurdo Sound, South Victoria Land, about the end of December.

The party numbers fifty men, of whom sixteen constitute the scientific staff. The list of officers, staff and men is appended to Captain Scott's statement.

At McMurdo Sound, the hut, provisions and equipment of the western party will be landed. This party will include twenty-two to twenty-five persons, and, by the third week in January, when sixty to seventy days still remain for traveling, most of them will start south to lay depots. At the same time, the vessel will steam east to land the eastern party on King Edward VII Land. If a suitable spot can be found for wintering, six or seven men will be left here, with full equipment, for the exploration of this unknown land in the following summer.

The ship will then return to McMurdo Sound and then proceed northward, probably about the third week in February. If sufficient coal remains, she will investigate the pack in the region of the Balleny Islands (directly north of South Victoria Land) and pass westward through or to the south of these islands. Captain Scott hopes that thus she may throw some further light upon the coastline between Cape North and Adélie Land (a part of Wilkes Land). This work and biological investigations will occupy the ship during March, after which she will return to New Zealand.

Captain Scott hopes that, by the end of April, the western party will be all safely re-established in the hut with depôts of supplies laid well south on the Great Ice Barrier (extending southward, across Ross Sea, to the continental coast). As the excessive winter cold does not begin to subside till September

and the conditions of travel are severe, even in October, he does not propose to start on the southern journey till October. That month and November will be spent in crossing the ice and ascending the glacier, and he hopes to reach the upper continental plateau early in December. It would be an ideal day to reach the South Pole, if it might be attained on Dec. 22, when the sun achieves its maximum altitude. With his special 4-inch theodolites and the sun at an altitude of 23° , the position of the pole could be determined within one mile. But Captain Scott does not lose sight of the fact that the attainment of the pole is by no means a certainty.

Lieut. E. R. G. R. Evans, of the Royal Navy, who has had Antarctic experience, will be second in command and will remain with the western party. Lieut. Victor Campbell, an ex-naval officer, will be in charge of the eastern party. Five members of the staff and seven members of the crew have had previous Antarctic experience. Dr. E. A. Wilson, zoologist and artist, will be chief of the scientific staff. Three geologists, Mr. T. Griffith Taylor, Mr. W. G. Thompson and another to be chosen in Australia will serve, one with the eastern, one with the southern or polar party, and the third will have a roving commission to explore Victoria Land within easy distance from the western station. Messrs. E. W. Nelson and D. G. Lillie, biologists, will have charge of the study of marine fauna. Five hundred fathoms have been fixed as the limit at which dredging operations can be conducted. Meteorology will be in charge of Dr. G. C. Simpson of the Meteorological Department of India. He will have a special hut and space for a very large outfit of scientific instruments. He will also undertake the magnetic and gravity observations on shore, auroral photography and make studies in other branches of physical science. Mr. C. S. Wright will be chemist of the expedition.

On ship board, Lieut. H. H. L. Pennell will have charge of the magnetic and meteorological records, assisted by Lieut. H. R. Bowers, and also of the survey or resurvey of any lands that may be visited by the *Terra Nova*. Surgeons G. M. Levick and E. L. Atkinson will look after the health of the men and also serve in scientific capacities, the former being a zoologist and botanist and the latter a bacteriologist. All members of the expedition have been medically examined and found fit for the work and have shown great enthusiasm for the arduous responsibilities before them.

EDUCATIONAL GEOGRAPHY

THE JOURNAL OF GEOGRAPHY. With the number for June, Prof. R. E. Dodge retired from the editorship and management of this educational magazine. He founded the *Journal*, and eight volumes, each containing ten monthly numbers, have been issued by him. The place of publication is now transferred from New York to Madison, Wis., the Department of Geography of the University of Wisconsin having assumed the work of continuing the magazine. Prof. R. H. Whitbeck, of that institution, is the new editor, and the first number under his direction will be issued in September, soon after the re-opening of the schools.

It is gratifying to know that the work inaugurated by Prof. Dodge is to go on. The publication is needed. It has been devoted to the interests of teachers of geography in the elementary, secondary and normal schools. It has had a marked tendency to raise the standards of geographical education, which, not

many years ago, lagged far behind those of nearly all other great nations. The *Journal of Geography* has been conspicuous in the movement to give teachers clearer ideas of the content of geography, to introduce more effective methods of instruction and to place in the hands of boys and girls better textbooks and better maps. It has helped to bring about the marked improvements that have been made. But a great deal remains to be done before school geography at home is placed upon the high plane which it occupies in some of the European countries; and there is good reason to believe that this periodical will continue to exert a helpful influence that could not well be spared.

PHYSICAL GEOGRAPHY

CLIMATIC VARIATIONS. Henryk Arctowski, well known to meteorologists, is at present engaged in a far-reaching investigation of simultaneous climatic variations over the earth's surface. Some of the results already reached are discussed in a recent monograph entitled *L'Enchaînement des Variations Climatiques* (Brussels, Soc. Belge d'Astron., 1909). The author has begun his work with a study of the annual mean temperatures, and in order to secure a comparable series of observations he has thus far limited himself to the ten-year period 1891-1900. For these years he has collected the observations for 804 stations,—an immense labor, which has involved the examination of thousands of publications and the writing of hundreds of letters for information. Of these stations 490 are in Europe, 97 in Asia, 38 in Africa, 134 in the two Americas, and 45 in Australia. The tables contain more than 20,000 figures. For each year, and each station, the departures between the mean annual temperatures and the mean normal temperature are determined. These differences (negative or positive) are placed on maps, and the points representing the same departures are joined by lines. It then appears that the areas where there are excesses or deficiencies of temperature do not fall accidentally here or there, but that they form vast zones. These zones Dr. Arctowski calls *thermopleions* and *antipleions*. More than 150 of these maps are given. It is seen that the temperature of the earth's atmosphere has been higher during the years 1896 to 1900 than between 1891 and 1895, the positive excess for the whole globe being between 0.4° and 0.9° F. The displacement of the annual pleions and antipleions is apparently very irregular, but there seem to be real centers from which the variations originate. In order to investigate further the mechanism of the formation of pleions, to find the laws which govern their displacement, to learn to predict the regions which will have excess or deficiency of temperature, and where the crops may therefore be inferior or abundant, the author has decided to investigate the monthly means of temperature, as well as pressure. The whole study is a very important one, and further results will be awaited with great interest.

R. DEC. W.

GENERAL

THE TENTH INTERNATIONAL GEOGRAPHICAL CONGRESS. The committee that is making arrangements for the meeting of the Tenth Congress which will be held in Rome next year, has issued its first circular. The time of the meeting will be Oct. 15-22, a week that will also be given in Rome to the commemoration of the proclamation of the Kingdom of Italy. This event, the committee believes, will

add additional interest to a visit to Rome without interfering with the business of the Congress. The President of the Congress and also of the organizing committee is the Marquis Raffaele Cappelli, President of the Italian Geographical Society. The regulations governing the Congress, printed in the circular, follow the same general lines as those adopted for the earlier Congresses. Eight sections, comprising the principal departments of geography, will be constituted and the languages of the Congress will be Italian, English, German, and French. Abstracts of communications which are proposed for presentation should reach the executive committee not later than April 30, 1911; and all reports on matters originating in previous Congresses, or recommended by the executive subcommittee, must be presented in full not later than August 31, 1911. Delegates to the Congress may be appointed by government, governmental departments, institutions and societies whose interests are geographical, and Universities and other higher schools which maintain professorships of Geography. Those who wish to be members are requested to send in their names at an early date, and upon the payment of the subscription (25 lire or \$5) they will receive their ticket of membership and all the information that will be issued from time to time. The treasurer of the Congress is avv. Felice Cordon, La Società Geografica Italiana, Roma, via del Plebiscito, 102. Information with regard to routes and accommodations in Rome may be obtained by addressing the "Ufficio viaggi ed informazioni gratuite," 372-373 Corso Umberto 1, Rome. The programme of excursions will be issued later and the complete programme of the Congress will be sent to all members.

THE OCEANOGRAPHICAL MUSEUM AT MONACO. This museum, which the Prince of Monaco has built, was opened with festivities that extended from March 29 to April 1. It was the occasion of an international gathering of the representatives of scientific societies. The building is a beautiful structure of white limestone, standing on the southern extremity of the peninsula of Monaco. It contains a large collection of apparatus for physical oceanography, collections of marine organisms, labelled in three languages, the nucleus of a fine exhibition of marine industries, and laboratories in which students and investigators of all nations may find the most ample facilities for carrying on their studies relating to the various sciences of the sea. The opening address, delivered by the Prince of Monaco, is printed in full in the *Geographical Journal* (Vol. 35, No. 5, 1910).

The Museum is a part of the Oceanographical Institute which the Prince has established to promote the interests of the science to which he has devoted his life. The first branch of the Institute is the School of Oceanography, which the Prince has founded in the University of Paris and for which buildings are now being erected. Three professors are conducting the work of the school: Dr. A. Berget for Physical Oceanography, Prof. L. Joubin for Biological Oceanography and Dr. Portier for the Physiology of Marine Life. The second branch of the Institute consists of the museum and laboratories at Monaco.